



Science Standards of Learning

Sample Scope & Sequence

Biology

*Commonwealth of Virginia
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Preface

As an additional resource to help school divisions develop curricula aligned to the 2003 Standards of Learning, the Virginia Department of Education has developed sample scope and sequence documents for kindergarten through grade eight and for core high school courses. These sample documents provide guidance on how the essential knowledge, skills, and processes that are identified in the Standards of Learning and the Standards of Learning Curriculum Frameworks may be introduced to students in a logical, sequential, and meaningful manner.

These sample scope and sequence documents are intended to serve as general guides to help teachers and curriculum developers align their curricula and instruction to support the Standards of Learning. Each sample document is organized around specific topics to help teachers present information in an organized, articulated manner. Also included are correlations to the Standards of Learning for that curricular area for a particular grade level or course, as well as ideas for classroom assessments and teaching resources.

The sample scope and sequence documents are not intended to prescribe how curriculum should be developed or how instruction should be delivered. Instead, they provide examples showing how teachers and school divisions might present to students in a logical and effective manner information that has been aligned with the Standards of Learning. School divisions that need assistance in developing curricula aligned with the Standards of Learning are encouraged to consider the sample scope and sequence guides. Teachers who use the documents should correlate the content identified in the guides with available instructional resources and develop lesson plans to support instruction.

The *Science Standards of Learning Sample Scope and Sequence* and the *Science Standards of Learning Curriculum Framework* can be found in both PDF and Microsoft Word file formats on the Virginia Department of Education's Web site at <http://www.doe.virginia.gov/VDOE/Instruction/sol.html>.

Introduction

Biology should be investigative and continually involve students in the scientific process. Students should be given numerous opportunities to evaluate and analyze data, particularly data they have collected. The Standards of Learning processes delineated in BIO.1 and BIO.2 are referenced numerous times in this sample scope and sequence. The classroom teacher is encouraged to incorporate them into many other parts of the curriculum as well.

This document is intended as a general guide to help teachers and schools frame a curriculum that incorporates the fundamentals of secondary science courses and to provide a correlation of those fundamentals to the Virginia Standards of Learning. It is organized around specific topics and includes correlations to the Science Standards of Learning, as well as ideas for assessments and resources. This document is not intended as a script for either curriculum developers or instruction, but it will provide teachers and curriculum developers a place to begin building a curriculum.

Organizing Topics	Related Standards of Learning
Investigating Biochemistry	BIO.1 a, b, c, e, f, h, i, k, l, m; BIO.3 a, b, c
Investigating Cells	BIO.1 a-e, i, l; BIO.2 a, b, c, e; BIO 3.d; BIO.4 a, b, c, d; BIO.5 a, b, f; BIO.6 a, b, c
Life Functions and Processes	BIO.1 a, b, c, d, i; BIO.2 c; BIO.3 d; BIO.5 d, e
Genetics	BIO.1 b, d, e, f, g; BIO.2 a, b, c, d, e; BIO.6 d, e, f, g, h, i
Natural Selection	BIO.1 d; BIO.7 a, b, c, d, e; BIO.8 a, b, c, d, e
Ecology	BIO.1 a, d, h; BIO.5 a, b, c; BIO.7 a; BIO.9 a, b, c, d, e

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Biochemistry	Identify, locate, and properly utilize MSDS and laboratory safety equipment, including aprons, goggles, gloves, fire extinguishers, fire blanket, safety shower, eye wash, broken glass container, and fume hood.	BIO.1 h	Lab practical Student lab report Quizzes	(See page 27 for Resources information.) <i>Science Standards of Learning Curriculum Framework</i>
	Review atoms, molecules, elements, compounds, and bonding in terms of the water molecule.	BIO.3 a	Unit tests	<i>Experiment with Enzymes</i> manual Periodic Table
	Explain the ability of water to <ul style="list-style-type: none"> stabilize air and land temperature; prevent lakes and oceans from freezing solid; allow organisms to get rid of excess heat. 	BIO.3 a		Textbook
	Evaluate the importance of water in living things due to its ability to dissolve many substances thus providing a medium for nutrients and wastes to be transported.	BIO.3 a		SOL Test Blueprints and Released Tests
	Investigate the pH of various water sources and solutions recognize that the pH of pure water is 7, but that various substances can lower or raise the pH. A solution with pH below 7 is acidic. A solution with a pH above 7 is basic.	BIO.3 a		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Biochemistry (continued)	Differentiate between diffusion and osmosis in terms of the types of substances involved and the role of a semi-permeable membrane.	BIO.3 a BIO.4 d		
	Apply the following principles of scientific investigation in terms of biochemistry: <ul style="list-style-type: none"> Identify variables that must be held constant. Identify the independent variable in an experiment. Select dependent variables that allow collection of quantitative data. Collect preliminary observations. Make clear distinctions among observations, inferences, and predictions. Formulate hypotheses based on cause and effect relationships. Use probeware for data collection. 	BIO.1 a, b, c, i		
	List the six elements that are the main components of a living cell (carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur).	BIO.3 b, c		
	Explain carbon's atomic structure and its role in forming the macromolecules of life and provide examples of compounds.	BIO.3 b, c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Biochemistry (continued)	Recognize that cells can make a variety of macromolecules from a relatively small set of monomers.	BIO.3 b, c		
	Identify and describe the following macromolecules and their structures: <ul style="list-style-type: none"> • Carbohydrates provide and store energy. • Lipids insulate, store energy, and make up cell membranes. • Proteins may be structural or may function in transport, movement, defense, or cell regulations. • Nucleic acids (DNA and RNA) control cell activities by directing protein synthesis. 	BIO.3 b, c		
	Give examples of each specific protein function.	BIO.3 b, c		
	Recognize the following: <ul style="list-style-type: none"> • Proteins are polymers made by linking together amino acid monomers. • A protein's structure depends on its specific conformation. 	BIO.3 b, c		
	Generalize the structure and function of enzymes, including their <ul style="list-style-type: none"> • definite three-dimensional shape that allows binding with a substrate; • ability to control the rate of metabolic reactions by acting as catalysts. 	BIO.3 b, c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Biochemistry (continued)	Understand that pH and temperature are important to cell functioning because <ul style="list-style-type: none"> • most organisms can tolerate small changes in pH; • most cells function best within a narrow range of temperature and pH; • at very low temperatures, reaction rates are too slow; • high temperatures or extremes of pH can change the structure of proteins and later their function. 	BIO.3 b, c BIO.1 e, f		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Cells	Summarize the development of early microscopes; and discuss how early microscopes, advanced microscopy, and other technologies have contributed to our knowledge of cell function and structure.	BIO.4 a, b, c BIO.2 a	Student lab report, including labeled diagrams of cells Student presentations Model building	(See page 27 for Resources information.) <i>Science Standards of Learning Curriculum Framework</i> Digital image sources Prepared microscope slides SOL Test Blueprints and Released Tests <i>Connecting Algebra and Biology Using Graphing Calculators</i> Textbook
	State the cell theory.	BIO.4 a, b	Lab practical on use of compound microscope	
	Illustrate how the modern cell theory exemplifies how scientific knowledge usually grows slowly, through contributions from many different investigators from diverse cultures.	BIO.2 e BIO.1 1	Quizzes Unit tests	
	Investigate and distinguish between eukaryotes and prokaryotes based on observations of size, presence of a defined nucleus, and the presence of organelles.	BIO.4 a, b BIO.2 b		
	Summarize the major cell concepts: <ul style="list-style-type: none"> Cells contain specialized structures to perform life functions. A single-celled organism has to conduct all life processes by itself. A multicellular organism has cellular specialization. Many diseases are caused by microorganisms. 	BIO.4 c, d BIO.2 c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Cells (continued)	Review cellular activities necessary for life.	BIO.4 a, b		
	Investigate the capture, storage, transformation, and flow of energy through the processes of photosynthesis and respiration.	BIO.3 d BIO.1 a-e, i		
	Point out that cells are the basic units of structure and function for all living things.	BIO.4 a, b		
	Diagram the fluid mosaic model of the cell membrane.	BIO.4 c, d		
	Summarize the six important functions of the cell membrane.	BIO.4 c, d		
	Distinguish between plant and animal cells.	BIO.4 a, b BIO.5 a, b		
	Relate the following essential cell structures to their functions: <ul style="list-style-type: none"> nucleus (contains DNA, site where RNA is made) ribosomes (site of protein synthesis) mitochondria (site of cell respiration) chloroplast (site of photosynthesis) endoplasmic reticulum (transports materials through the cell) 	BIO.4 a, b BIO.3 d		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Cells (continued)	(continued) <ul style="list-style-type: none"> • Golgi apparatus (cell products packaged for export) • lysosomes (contain digestive enzymes) • cell wall (provides support) 	BIO.4 a, b BIO.3 d		
	Explain the following: <ul style="list-style-type: none"> • The simplest life forms exhibiting cellular structure are prokaryotes. • Earth's first cells were prokaryotes. • Prokaryotic cells exist in two major forms--Eubacteria and Archaeobacteria. • Prokaryotes are the Earth's most abundant organisms due to their ability to live in a variety of environments. • Eukaryotes are more complex than prokaryotes and developed into larger more complex organisms, from single-celled Protista to multi-cellular fungi, plants, and animals. 	BIO.4 a, b		
	Distinguish between viruses and cells.	BIO.5 f		
	Illustrate the viral reproductive cycle.	BIO.5 f		
	Discuss the different types of cells that undergo mitosis and cytokinesis and their rates of cell division.	BIO.6 a, b, c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Cells (continued)	Describe the events that occur during the cell cycle; emphasizing mitosis and cytokinesis	BIO.6 a, c		
	Diagram the different phases of the cell cycle labeling the parts of the cell that are pertinent. Records may include the percentage of the time cells spend in each phase.	BIO.1 a BIO.6 a		
	Summarize the following regarding meiosis: <ul style="list-style-type: none"> • Meiosis occurs in sexual reproduction when a diploid cell produces four haploid daughter cells that can mature to become gametes. • Many organisms combine genetic information from two parents to produce offspring through sexual reproduction. Sex cells produced through meiosis allow genetically differing offspring. 	BIO. 6 b		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Life Functions and Processes	<p>Generalize the following regarding energy processes:</p> <ul style="list-style-type: none"> Plant cells and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy-rich organic molecules and release oxygen into the environment. The process of photosynthesis provides a vital connection between the sun and the energy needs of living things. The breakdown of nutrient molecules enables all cells to utilize energy stored in specific chemicals to carry out the life functions of the cell. Photosynthesis and cell respiration are complementary processes for cycling carbon dioxide and oxygen in ecosystems. Light is the initial source of energy for most communities. 	<p>BIO.3 d</p> <p>BIO.1 a, b, c, i</p>	<p>Quizzes</p> <p>Unit tests</p> <p>Lab practical</p> <p>Student lab reports</p> <p>Data analysis and interpretation</p>	<p>(See page 27 for Resources information.)</p> <p><i>Science Standards of Learning Curriculum Framework</i></p> <p><i>Project WILD</i></p> <p><i>Project Learning Tree</i></p> <p>Probeware</p> <p>Simulation software</p> <p>Models</p> <p>Textbook</p> <p>SOL Test Blueprints and Released Tests</p> <p><i>Connecting Algebra and Biology Using Graphing Calculators</i></p>
	Relate plant structures and functions to process of photosynthesis and respiration.	BIO.3 d		
	Illustrate and describe the energy conversions that occur during photosynthesis and respiration.	BIO.3 d		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Life Functions and Processes (continued)	<p>Summarize the process of photosynthesis, including the facts that</p> <ul style="list-style-type: none"> cells trap energy from sunlight with chlorophyll, and use the energy, carbon dioxide, and water to produce energy-rich organic molecules and oxygen; photosynthesis involves an energy conversion in which light energy is converted to chemical energy in specialized cells (e.g., plants and some protists). 	BIO.3 d		
	<p>Summarize the processes of cells, including</p> <ul style="list-style-type: none"> eukaryotic cells (plant and animals) burn organic molecules with oxygen to produce energy, carbon dioxide, and water; cells release the chemical energy stored in the products of photosynthesis. This energy is transported in molecules of ATP; when cells need energy to do work, certain enzymes release the energy stored in the chemical bonds in ATP. <p>Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.</p>	BIO.3 d		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Life Functions and Processes (continued)	Recognize that many organisms, including human beings, are composed of groups of cells (tissues, organs, and systems) that are specialized to provide the organism with the basic requirements of life: obtaining food and deriving energy from it, maintaining homeostasis, coordinating body functions, communicating between cells, and reproducing.	BIO.5 d, e		
	Explain the purpose and functioning of the following human systems: <ul style="list-style-type: none"> • digestive • respiratory • circulatory • excretory • immune • nervous • endocrine • skeletal • integumentary 	BIO.5 d, e		
	Discuss the major factors that impact human health, including <ul style="list-style-type: none"> • genetic predispositions; • microorganisms; • environmental influences. 	BIO.5 e BIO.2 c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Life Functions and Processes (continued)	<p>Recognize that the acceptance of the germ theory of disease has resulted in a modern emphasis on sanitation, including</p> <ul style="list-style-type: none"> • safe handling of food and water; • aseptic techniques; • development of vaccines; • chemicals and processes to destroy microorganisms. 	BIO.2 c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Genetics	<p>Outline the major historical steps in determining DNA structure, including the following:</p> <ul style="list-style-type: none"> Studies of the amounts of each DNA base in different organisms led to the concept of complementary base-pairing. Genetic information encoded in the DNA molecules provides instructions for assembling protein molecules. The genetic code is the same for all life forms. The double helix model explained how hereditary information is passed on, and provided the basis for an explosion of scientific research in molecular genetics. 	BIO.2 d, e	<p>Quizzes</p> <p>Unit tests</p> <p>Lab practical</p> <p>Problem sets including practical applications</p> <p>Student presentations</p> <p>Literature research projects</p>	<p>(See page 27 for Resources information.)</p> <p><i>Science Standards of Learning Curriculum Framework</i></p> <p>Simulation software</p> <p>Calculators</p> <p>DNA models and kits</p> <p>Textbook</p> <p>SOL Test Blueprints and Released Tests</p> <p><i>Connecting Algebra and Biology Using Graphing Calculators</i></p>
	<p>Summarize DNA structure and function, including the following:</p> <ul style="list-style-type: none"> Genetic code is a sequence of DNA nucleotides. DNA is a polymer of four nucleotide monomers. A nucleotide contains one of the following bases: adenine, guanine, cytosine, or thymine; phosphate, and the 5-carbon sugar deoxyribose. DNA is double-stranded molecule connected by complementary nucleotide pairs (A-T, C-G) like rungs in a ladder. The ladder twists to form the double helix. 	<p>BIO.2 d, e</p> <p>BIO.6 e, f, g</p>		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Genetics (continued)	(continued) <ul style="list-style-type: none"> DNA stores the information for directing the construction of proteins within a cell. These proteins determine the phenotype of an organism. 	BIO.2 d, e BIO.6 e, f, g		
	Summarize the main features of DNA replication.	BIO.6 f		
	Describe the structure and function of each type of RNA.	BIO.6 f, g		
	Given a DNA sequence, write a complementary mRNA strand (A-U, T-A, C-G and G-C).	BIO.6 f		
	Compare the structure of RNA with that of DNA.	BIO.6 f		
	Summarize the processes of transcription and translation.	BIO.6 f		
	Explain that DNA technologies allow scientists to identify, study, and modify genes. Forensic identification is one example of the application of DNA technology.	BIO.6 i		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Genetics (continued)	Recognize that genetic engineering techniques provide great potential for useful products (e.g., human growth hormone, insulin, and resistant fruits and vegetables).	BIO.1 j BIO.6 h, i		
	Discuss the Human Genome Project as a collaborative effort to map the entire gene sequence. This information will be useful in detection, prevention, and treatment of many genetic diseases. It also raises practical and ethical questions.	BIO.1 j BIO.6 h, i		
	Define cloning as the production of genetically identical cells and/or organisms.	BIO.6 h, i		
	Summarize major genetic principals: <ul style="list-style-type: none"> Geneticists apply mathematical principles of probability to Mendel's laws of inheritance in predicting simple genetic crosses. Mendel's laws of heredity are based on his mathematical analysis of observations of patterns of inheritance. The laws of probability govern simple genetic recombinations. 	BIO.1 j BIO.6 d		
	Discuss accuracy, confidence, and sources of experimental error based on number of trials and variance in data.	BIO.1 d, e, f, g		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Genetics (continued)	Critically examine and discuss the validity of results reported in scientific and popular literature and databases.	BIO.1 j		
	Define genotype and phenotype.	BIO.6 d		
	Differentiate between homozygous and heterozygous.	BIO.6 d		
	Distinguish between dominant and recessive alleles and their affect upon phenotype.	BIO.6 d		
	Predict possible gametes in monohybrid and dihybrid crosses given parental genotypes.	BIO.6 d		
	Use a Punnett square to show all possible combinations of gametes and the likelihood that particular combinations will occur in monohybrid and dihybrid crosses.	BIO.6 d		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Genetics (continued)	<p>Summarize possible results of genetic recombination:</p> <ul style="list-style-type: none"> • Sorting and recombination of genes in sexual reproduction results in a great variety of gene combinations in offspring. • Inserting, deleting, or substituting DNA segments can alter genes. • An altered gene may be passed on to every cell that develops from it, causing an altered phenotype. • An altered phenotype may be beneficial or detrimental. • Sometimes entire chromosomes can be added or deleted, resulting in a genetic disorder such as Trisomy 21 (Down's syndrome) and Turner syndrome. 	BIO.6 e		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Natural Selection	Define a species as a group of organisms that has the ability to interbreed and produce fertile offspring.	BIO.7 a	Quizzes Unit tests	(See page 27 for Resources information.) <i>Science Standards of Learning Curriculum Framework</i> Simulation software <i>Forest Biodiversity Monitoring Techniques</i> manual <i>Project WILD</i> Audiovisuals Textbook SOL Test Blueprints and Released Tests
	Identify local populations (populations are groups of interbreeding individuals that live in the same place at the same time, and compete with each other for food, water, shelter, and mates).	BIO.8 b, c, d	Group lab reports Student presentations Interpretation of cladograms	
	Interpret a cladogram or phylogenetic tree showing evolutionary relationships among organisms.	BIO.7 e		
	Relate genetic mutations and genetic variety produced by sexual reproduction to diversity within a given population.	BIO.8 b, c, d		
	Explain the following relative to population dynamics: <ul style="list-style-type: none"> • Populations produce more offspring than the environment can support. • Organisms with certain genetic variations are favored to survive and pass their genes on to the next generation. • The unequal ability of individuals to survive and reproduce leads to the gradual change in a population (natural selection). • Genetically diverse populations are more likely to survive changing environments. 	BIO.8 b, c, d		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Natural Selection (continued)	Plot data representing population growth.	BIO.1 d		
	Explain how Charles Darwin, through his observations in the Galapagos Islands, formulated his theory of how species change over time.	BIO.8 b, c, d		
	<p>Summarize the major concepts of natural selection:</p> <ul style="list-style-type: none"> • Natural selection is governed by the principles of genetics. The change in the frequency of a gene in a given population leads to a change in population and may result in the emergence of a new species. • Natural selection operates on populations over many generations. • Mutations can result in genetic changes in the gene pool and thus can affect population change over time. • Adaptations sometimes arise in response to environmental pressures (e.g., development of antibiotic resistance in bacterial populations, morphological changes in the peppered moth population, pesticide resistance). 	BIO.8 b, c, d		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Natural Selection (continued)	Summarize the relationships between present day organisms and those that inhabited the Earth in the past, including <ul style="list-style-type: none"> • fossil record; • embryonic stages; • homologous structures; • chemical basis (e.g., proteins, nucleic acids). 	BIO.8 a BIO.7 a, b, c, d, e, f		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Ecology	Define carrying capacity and limiting factors as they relate to ecosystems.	BIO.9 a	Quizzes	(See page 27 for Resources information.) <i>Forest Biodiversity Monitoring Techniques</i> manual Chesapeake Bay Foundation <i>Project Wild</i> <i>Project Wet</i> <i>Project Learning Tree</i> GLOBE Project Virginia Naturally Web Site Field guides Textbook SOL Test Blueprints and Released Tests <i>Connecting Algebra and Biology Using Graphing Calculators</i> <i>Science Standards of Learning Curriculum Framework</i>
	Compare the effect of biotic and abiotic factors on populations.	BIO.9 a	Unit tests	
	Define symbiosis, and differentiate between mutualism, commensalism, and parasitism.	BIO.9 a	Lab practical	
	Create a growth curve and identify and explain initial growth, exponential growth, steady state, decline, and extinction.	BIO.9 a BIO.1d, e, i	Field reports Construction and use of a dichotomous key Student presentations on local examples	

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Ecology (continued)	Graph and interpret a population growth curve and relate it to carrying capacity.	BIO.6 a BIO.1 d		
	Construct and utilize dichotomous keys to classify organisms.	BIO.7 a, g		
	Observe and identify flora and fauna in a local community, using field guides and dichotomous keys for identifying and describing organisms that characterize the local biome.	BIO.7 a, g		
	Illustrate ecological succession as a series of changes in a community in which new populations of organisms gradually replace existing ones.	BIO.9 b, c		
	Define and identify examples of a climax community in Virginia (e.g. deciduous oak-hickory forest).	BIO.9 b, c		
	Given an illustration of a food chain, food webs, and an energy pyramid, describe each organism as a producer, consumer, or decomposer and their relationship.	BIO.9 b, c		
	Recognize that nutrients cycles in an ecosystem. The most common examples include carbon, oxygen, nitrogen, and water.	BIO.9 b, c		

Organizing Topic	Essential Knowledge and Skills	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Ecology (continued)	Diagram a community to show that it is a collection of interacting populations.	BIO.9 a		
	Differentiate and give examples of the following from local ecosystems: <ul style="list-style-type: none"> • autotrophs and heterotrophs • multicellular and unicellular organisms • motile and non-motile organisms • organisms with and without cell walls • sexually and asexually reproducing organisms • aquatic and terrestrial organisms • behavioral responses to the environment 	BIO.5 a , b, c, g BIO.7 g BIO.1 a BIO 9.e		
	Examine the effect of human activities such as reducing the amount of forest cover, increasing the chemicals released into the atmosphere, and intensive farming have changed the Earth’s land, oceans, and atmosphere and also its capacity to support life forms.	BIO.9 d, e BIO.1 h		
	Locally, or in a larger geographical area such as the Chesapeake Bay watershed, identify and describe an ecosystem, including <ul style="list-style-type: none"> • effects of biotic and abiotic components; • examples of interdependence; • evidence of human influences; • energy flow and nutrient cycling; • diversity analysis; • ecological succession. 	BIO.9 d, e BIO.1 a		

Resources

Chesapeake Bay Foundation – <http://www.savethebay.cbf.org>

Chesapeake Bay Program – <http://www.chesapeakebay.net>

*Connecting Algebra and Biology**

Experiment with Enzymes manual*

Forest Biodiversity Monitoring Techniques manual*

The GLOBE Project – <http://www.globe.gov>

Project Learning Tree, Virginia Department of Forestry, 804-328-3031

Project Wet, Virginia Department of Environmental Quality, 804-698-4442

Project Wild, Virginia Department of Game and Inland Fisheries, 804-367-0188

Safety in Science Teaching manual – <http://www.doe.virginia.gov/VDOE/Instruction/safetymanual.pdf>

SOL Released Tests – <http://www.doe.virginia.gov/VDOE/Assessment/releasedtests.html>

SOL Test Blueprints – <http://www.doe.virginia.gov/VDOE/Assessment/soltests/home.html>

Science Standards of Learning Curriculum Framework – <http://www.doe.virginia.gov/VDOE/Instruction/Science/sciCF.html>

Virginia Institute of Marine Science (VIMS) – <http://www.vims.edu>

Virginia Naturally – <http://www.vanaturally.com/>

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